Precious Metal VERIFIER

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How to use the Precious Metal Verifier

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I . How to Use the Sensors

Note: Most often you will find yourself putting one ounce coins or bars on the Precious Metal Verifier (PMV) main sensor. The main sensor is the work horse for one ounce coins and bars. But, if you don't know better, you'll end up using the main sensor for just about everything and this leads to errors. So read this section with an eye toward noticing the exceptions.

A. Using the Main Sensor

The main sensor measures 1 ounce coins and bullion bars as well as many ½ oz coins. The main sensor is identified by the target circle on the top of the unit. Most of the time you will use the main sensor. However, it has some limitations

1. Coin Diameter: Coins must be large enough in diameter to cover the thick black target on the main unit sensor. Samples in slabs and plastic holders need to cover the outside of the target and bare samples or samples in plastic bags need to cover to the inside of the target. If the sample is too small the reading will be wrong. If the sample is directly on the sensor it must be at least 24 mm diameter, if the sample is in a case it must be 30 mm diameter.
2. Coin Thickness: Thickness of the coins and bars is important. Testing an item that is too thin for a given metal type is likely to give false readings. It's important to know what the limits are for the main sensor. Below is a table of the minimum coin or bar thicknesses that can be measured on the main sensor. Limits with and without the calibration disc are shown.

Metal Category	Test object alone (mm)	With calibration disc (mm)
Silver .999 pure or better	1.0	.8
Gold .999 pure or better, and Silver Alloys (90%,sterling, etc)	1.1	.8
Rhodium	1.6	.9
Gold alloys, Platinum and Palladium	2.4	1.7

Minimum Coin Thickness for the PMV main sensor (table 1)

Thinner pieces can be measured using one of the smaller wands or by using the calibration disk. The calibration disc is the coin sized metal piece with the Precious Metal Verifier (PMV) logo. Using this disc with the main sensor, place your coin or bar on top of the sensor target and then place the disc on top of the item you are testing. Make sure the calibration disc is directly above the sensor circle.

3. Detection Depth: The main sensor will detect down to a depth of .5 mm for pure gold and silver alloys. It will detect down to a level of 2mm for 22k gold, 90% gold, platinum and palladium, and .8 mm for rhodium. This level also depends on the type of counterfeit metal under the metal in the test range. For example, it is easier to detect tungsten under gold than silver under gold, because the resistivity of tungsten is far higher than gold, whereas that of silver is fairly close.
4. Slabs: Some slabs have wall heights that prevent the main sensor from reaching into the coin. At this point the large wand can be used. (see following page)

Example: A 1 oz Gold Mapleleaf is 30 mm in diameter and 2.79 mm thick. It is large enough to cover the main sensor and more than 1.1 mm thick, therefore it is okay to use the main sensor to measure this coin.

B. Using the Large and Small Wands There are two wands available for the Precious Metal Verifier Basic Set, they are also included with the Bullion unit. The large wand sensor is 20 mm in diameter. It is used for checking 1/2 oz and 1/4 oz coins. It is also useful for checking coins in slabs that the main sensor cannot reach. The small wand sensor is 9mm in diameter and is used for measuring small coins that are less than 1/4 oz, unless the coin is in a slab. The small wand, while being able to read through plastic covers and bags, cannot read into most slabs.

1. Coin Diameter: Incorrect readings will occur if the sample is to small in diameter for a sensor. Items being tested must completely cover the surface of the wand. For the Large wand if the item is in direct contact and not in a case it must be at least 18 mm in diameter, if the item is in a case it must be 24 mm in diameter. For the small wand the item must be at least 8 mm in diameter, and not cased. The item being tested must cover the entire sensor area.
2. Coin Thickness and Detection Depth: As with the main sensor thickness of the coins and bars is important. Testing an item that is too thin for a given metal type is likely to give false readings. It is important to know what the limits are for the small and large wands. The small and large wands will detect down to a depth of .35 mm (.014 in.) for pure gold and silver alloys. They will detect down to a level of 1.4 mm for 22k gold, 90% gold, platinum and palladium, and .55 mm for rhodium. Below is a table of the minimum coin or bar thicknesses that can be measured with the large and small wands. Limits with and without the calibration disc are shown

Metal Category	Test object alone (mm)	With calibration disc (mm)
Silver .999 pure or better	.8	.4
Gold .999 pure or better, and Silver Alloys (90%,sterling, etc)	.8	.4
Rhodium	1.1	.8
Gold alloys, Platinum and Palladium	1.7	1.0

Minimum Coin Thickness for the PMV Small and Large Wands (table 2)

Example: A 1/2 oz Gold American Eagle is 27 mm in diameter and the coin will cover the target of the main sensor, but it has a thickness of only 1.75 mm. By reviewing tables 1 and 2 you can see that you can choose to use the main sensor with the calibration disc or the large or small wand without the calibration disc to measure this coin.

Example: A one gram Credit Suisse gold bar has a width of 8mm and a thickness of .4mm. Due to its narrow width you cannot measure this with the large wand, the small wand along with the calibration disk must be used to get an accurate result.

C. The Bullion Wand Care must be taken when using this wand as it is very sensitive to the thickness and metal composition of the items being measured, and reads deeper into bars than the main sensor. The bullion wand is used for gold, silver and other precious metal bars and will only work with the PMV bullion unit.

1. Sample Thickness and Size The thickness of the sample is important to receive an accurate measurement when using the bullion wand. If the sample is to thin the signal from this wand will run directly thru giving an inaccurate reading. Use of the calibration disk may be needed. The bullion wand will not work with standard coins. The item being measured must be at least 22 mm diameter and completely cover the sensor surface. Please see the chart below and be sure your sample matches the specifications.

Metal Category	Test object alone (mm)	With calibration disc (mm)
Silver .999 pure or better	4.0	3.3
Gold .999 pure or better, and Silver Alloys (90%,sterling, etc)	4.5	3.3
Rhodium	6.3	3.7
Gold alloys, Platinum and Palladium	7.0	6.5

Minimum Coin Thickness for the PMV Bullion Wand (table 3)

2. Detection Depth When measuring pure gold and silver, the bullion wand can detect sub-surface metal changes of 2 mm – 2.5 mm (80-100 mils). It will detect down to a level of 4-5 mm for 22k gold, 90% gold, platinum and palladium, and for rhodium down to 3 mm.

3. Enhanced Database and False Readings The bullion PMV has a bullion metal database that is optimized for increased sensitivity to gold, silver and other precious metals. These higher resolution ranges give you the optimum database to check samples with, however the bullion wand can be used with the standard metals database.

Using the Bullion Wand Continued.....

The bullion units enhanced database has a narrow silver range has been set up to distinguish silver from copper. This range is actually narrower than some .999 silver bars, and when a .999 silver bar has contaminants in it the cursor on the display will move to the right. Thus, a real .999 silver bar could read outside the brackets as fake. (note: copper reads 3- 4 blocks to the right of the brackets). If a silver bar measures outside the brackets further investigation is required. Carefully check the volume of the bar against its weight, confirm the dimensions, and possibly even file a corner to validate the sample.

Example: A 2 oz Platinum Koala is 40.6 mm in diameter and 3.8 mm thick. If it were .9999 gold or silver you could measure it using the Bullion wand with the calibration disc. However, if you look at tables 1 and 3, since platinum has a higher resistivity, you will need to use the main sensor to measure this and you won't need to use the calibration disc.

D. Effects of Surface Relief: Surface relief is the sculpted surface variations and imprints on the coin or bar. This makes the surfaces of the sensor heads vary in their distance from the surface of the metal and this can affect the PMV readings. This is especially true for the small wand. The surface effect is less of a factor in the main sensor and bullion wand. The best reading accuracy is obtained by checking the smoothest part of a coin or bar and making sure the sensor is as close to flat on the bar as possible. Be sure to measure both sides of a sample when there is a concern about the reading.

E. Calibration Disk and Thin Samples: If the unit has been giving unexpected readings then you can recalibrate the PMV by placing the calibration disk on the sensor, it can also be used to assist in the measurement of thin samples.

When a sample is too thin and unexpected readings are occurring the calibration disk can be used behind the thin sample when using wands or on top of a thin sample when using the main sensor. If the reading moves more than 2 cursors with the calibration disk from its original reading without the calibration disk, then the sample is too thin for the selected sensor.

Example: a 20 franc Swiss coin from the early 1900's is specified as 90% gold. The coin is 1.25 mm thick and 21 mm in diameter. The coin is too small to cover the main sensor target so the main sensor cannot be used, whereas the large (18 mm) wand and small (7.4 mm) will both completely cover the coin. Remember though, the coin must be at least 1.7 mm thick to be measured using these sensors. So the calibration disk must be used behind the sample. Using the calibration disc the PMV can measure down to 1.0 mm thickness for these materials, and will get an accurate reading on the 20 franc Swiss coin.

II. Why isn't the Precious Metal Verifier suitable for testing jewelry?

There are two main reasons why the PMV cannot sample jewelry. First, there are size and shape limitations, and second, the alloy content of jewelry is too variable. The PMV signal cannot measure inconsistent or thin surfaces such as woven braids, curved surfaces and narrow dimensions. Also, the the alloy content of jewelry varies. Jewelers make their own mixes of alloys, sometimes 14 K gold means the remaining metal is all copper and sometimes the remaining metal is all silver, and sometimes it's a combination of both. Sometimes 14K gold is really only 13 K or 13.6 K. The PMV is not sutable for testing jewelry.

III. Testing Cast Bars and Locating Imperfections

Some 10 oz, 50 oz and 100 oz bars, particularly the silver ones have cracks, or other irregularities such as shrinkage defects that make measurements with the PMV challenging. These irregularities can be sub- surface.

The PMV uses a circulating current and cracks can block the circulation. When a reading jumps in a localized area on a bar it could be a crack. Generally this does not mean that the sample is inconsistent with the metal being measured, but be sure to test other areas on the bar to get a sense of the overall content. Be sure that the sensor is as flat to the bar as possible and that areas of high relief are avoided. When there is a lot of variation over the surface of a silver .9999 or .999 bar, the reading furthest to the left is likely the most accurate. Also, for thick samples with high relief the bullion wand is recommended as it is less sensitive to surface features than the other sensors.

IV. Measuring Silver

Note: In our market research coin dealers who use the PMV appreciate having a .9999 silver scale and a .999 scale. While most pure silver coins, both .999 and .9999, will measure within the brackets on the .9999 scale, some.999 silver coins fall out. Most notably among these is the American Silver Eagle (ASE). Most ASE's will measure fine on the .9999 scale, but some do not even though they are real.

There is a percentage of certain .999 silver bullion that measures slightly higher than what would be expected. The .999 silver range will help identify the .999 silver coins with additives, for instance copper. Pure copper will read on the far right side within the .999 range though it will fall out of the brackets on the .9999 range. If a .999 silver eagles reading falls on the far right of the brackets caution is advised, check the thickness, diameter and weight of the coin against published standards. Usually, copper coins are plated with a nickel barrier to prevent the silver from being absorbed by the copper, and this will make a copper coin or bar read outside the brackets. The Bullion wand version of the PMV has a enhanced bullion category for metals. It has an even more selective silver scale. This scale is over twice as sensitive as the standard .9999 range and is in place to ensure that the silver bars tested are clearly distinguished from silver plated or silver clad copper.

Coin Silver

The Precious Metal Verifier offers three metal settings to measure coins that are 90% silver. These settings are 90% Coin, Morgan dollar, and Peace dollar. Be aware that numismatic morgans and peace dollars are often faked with silver and copper in the correct alloy, when this is done you cannot identify the false item with the PMV

1. 90% Coin Silver The 90% Coin silver range is set to measure an alloy that is 90% silver and 10% copper. Modern silver coins, after around 1940 measure well in this range.

2. Morgan dollars. Morgan's vary considerably in their metallurgy. Although these coins are 90% silver, the remaining metal isn't always pure copper. One Morgan we tested was .6% lead while another was .06% lead. These differences make for wide variation in the resistivities of the Morgan dollars. We have tested hundreds of Morgans but be advised that this is a very large range. It has been used to detect fake Morgan's that are made from materials other than copper and silver. Use due diligence in visual inspection, weighing and checking dimensions.

3. Peace dollar Peace dollars have a rather consistent metallurgy. The Peace dollar range is also useful for Walking Liberty coins and genrally coins post 1900 made of 90% silver.

V. Measuring Gold

The PMV tests a metals resistivity. Gold has a higher resistivity than copper, but lower than zinc or tin. So, unlike silver, there are combinations of alloys that can have the same resistivity as gold.

When readings are uncertain, be advised to measure the items thickness and diameter. Weigh the sample and make sure the weight and dimension match the expected value. If a counterfeit sample matches the resistivity of gold, its weight and/or dimensions will usually be off by more than a factor of two.

Tungsten has practically the same specific gravity as gold, this means that for a given volume tungsten and gold can have the same weight. Gold bars have been counterfeited by covering tungsten under a gold clad surface. This was a main reason for the development of the PMV Bullion wand. Most tungsten samples, within the depth limit of the sensor used, will be rejected by the PMV as they have a much higher resistivity than gold.

VI. Measuring Platinum, Palladium, and Gold Alloys

Platinum, Palladium, 22K gold, 90% gold, and American Eagle gold have resistivities about 4 times higher than pure gold, copper, silver, and copper-silver alloys. Due to these resistivities, the PMV signal can penetrate twice as deep into the surface and is at risk of reading through the coin, thus giving a false result. When measuring these types of coins and bullion carefully check the minimum thicknesses using the sensor selection charts. See the section on how to use the Calibration disk for important examples that will help you avoid erroneous readings.

VII. Why sometimes you won't get a reading

Note: Occasionally you will have a coin will be on the PMV and nothing happens. Here are some common reasons.

1. Recalibrate: If you have placed a sample and display is not giving a result but instead reads "remove sample press run/cal", then recalibrate the instrument by following the direction. Once that is done retest your sample.

2. Slabs and Numismatic Casing: The PMV is designed to penetrate through numismatic cases and plastic holders. This works well for 1 oz and 1/2 oz coins. However, for the small wand in most instances 1/10 oz coins in slabs are too far away get a reading. This can happen for some 1/4 oz. coins in slabs. When this occurs try and measure the other side of the slab, as sometimes the other side of the coin may be closer to the surface. The large wand penetrates deeper than the small wand and it can sometimes pick up a reading that the small wand cannot, but you will need to make sure that the diameter of the coin being measured is as large as the head of the wand.

3. Magnets and Magnetics: To try and fake the weight of precious metal coins, magnetic materials such as iron are often used. Of course, these fakes can be easily identified using a magnet. The PMV will not recognize or give a reading for coins such as this, due to the magnetic properties involved.

Please feel free to contact us at our website with your questions and comments.

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